

Customized Sharing Settings to Improve the Sustainability of HIEs: An Experimental Approach Using SAS

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ABSTRACT

Health information exchanges (HIEs) are platforms that enable the sharing of patient health information (PHI) among healthcare providers. HIEs offer many benefits; such as lower cost, faster services, and better health outcome to both patients and providers. However, most HIEs have a rigid consent mechanism that provides access to all participating providers to PHI for all consenting patients. This research investigates the impact of granting greater control to patients in sharing their personal health information on consent rates and making them active participants in the HIEs system. This research utilizes a randomized experimental survey design study. The study uses responses from 388 participants and applies confirmatory factor analysis (CFA) and structural equation modeling (SEM) using SAS® 9.4 to test the conceptual model (i.e. PROC CALIS and PROC FACTOR). The main findings of this research include that the patient's consent rate increases significantly, when greater control in sharing PHI is offered to the patient. In addition, greater control reduces the negative impact of privacy concerns as related to the intent to consent.

INTRODUCTION

Health Information Exchanges (HIEs) are multisided platforms that simplify the sharing of patient health information among many participating users such as hospitals, primary care physicians, and lab test providers. This makes the patient's history available to physicians treating the patient prior to delivery of care. However, many patients are passive participants of the system. A mechanism to engage more patients in the system is for of HIEs to grant more control to patients in what information to share and who to share it with.

This study investigates two main questions: Will greater control in PHI sharing yield higher HIE consent? How does greater control in PHI sharing change the relationship between the intention to consent and each of the independent variables (such as privacy concerns, trust in healthcare professionals, social influence, and health concerns)?

METHODS

PROCEDURE

Using random assignment, participants were assigned to one of two sharing settings: 1. Binary Sharing Setting 2. Customized Sharing Setting. Of the 388 participants included in the study, 195 participants were assigned to the binary sharing setting and 193 were assigned to the customized sharing setting. SAS 9.4 was used to recode the data. In a Binary sharing setting, patients can choose between a. share all of their PHI with all participating healthcare providers or b. share nothing at all. In a customized sharing setting, patients can choose what to share and with whom (for example, a patient may choose to share only lab tests with doctor A).

MEASUREMENT MODEL FIT

Confirmatory factor analyses (CFA) was performed using PROC CALIS to evaluate the measurement model and check the validity and reliability of the multi-item constructs. The results, in Table 1, confirms that the loadings for all items are high and significant. The measurement model indices satisfies the threshold showing an excellent fit of the measurement model. For example, comparative fit index (CFI) is 0.98, and root-mean-square error of approximation (RMSEA) is 0.048. Table 2 shows a sample for the question items.

Variable	Item	Loading
Intention to Consent	INT1	0.969***
	INT2	0.952***
	INT3	0.939***
Privacy Concerns	PC1	0.782***
	PC2	0.785***
	PC3	0.819***
Trust in Health	THP1	0.919***

Professionals	THP2	0.888***
	THP3	0.869***
Perceived Usefulness	PU1	0.83***
	PU2	0.866***
	PU3	0.832***
Social Influence	SI1	0.891***
	SI2	0.938***
	SI3	0.878***
Health Concerns	HC1	0.852***
	HC2	0.785***
	HC3	0.584***
Measurement Model Indices	RMSEA	0.048
	CFI	0.98
	TLI	0.975
	X²/DF	1.884
***= P<0.001		

Table 1. CFA Results

Construct	Items
INT	Under this setting, as a patient I am likely to consent.
PC	I am concerned about threats to the privacy of my electronically stored personal health information.
THP	Users (such as doctors, administrators and nurses) of HIE are trustworthy.
PU	The advantages of HIE will outweigh the disadvantages.
SI	People who are important to me would think that I should consent to HIE.
HC	I always worry about my health.

Table 2. Sample Questions

CFA CODE

```

PROC CALIS DATA=WUSS.gc;
LINEQS
    INT_1= 1          f1 + e01,
    INT_2= 1y02_1    * f1 + e02,
    INT_3= 1y03_1    * f1 + e03,
    PC_1= 1          f2 + e04,
    PC_2= 1y05_2    * f2 + e05,

```

```

PC_3= ly06_2      * f2 + e06,
THP_1= 1          f3 + e07,
THP_2= ly08_3    * f3 + e08,
THP_3= ly09_3    * f3 + e09,
PU_1= 1          f4 + e10,
PU_2= ly11_4     * f4 + e11,
PU_3= ly12_4     * f4 + e12,
SI_1= 1          f5 + e13,
SI_2= ly14_5     * f5 + e14,
SI_3= ly15_5     * f5 + e15,
HC_1= 1          f6 + e16,
HC_2= ly17_6     * f6 + e17,
HC_3= ly18_6     * f6 + e18;

```

STD

```

e01-e18=the01-the18,
f1-f6 = phil-phi6;

```

COV

```

f1 f2 = fcov1_2,
f1 f3 = fcov1_3,
f1 f4 = fcov1_4,
f1 f5 = fcov1_5,
f1 f6 = fcov1_6,
f2 f3 = fcov2_3,
f2 f4 = fcov2_4,
f2 f5 = fcov2_5,
f2 f6 = fcov2_6,
f3 f4 = fcov3_4,
f3 f5 = fcov3_5,
f3 f6 = fcov3_6,
f4 f5 = fcov4_5,
f4 f6 = fcov4_6,
f5 f6 = fcov5_6;

```

run;

ANALYSIS AND RESULTS

Using PROC CALIS, Structural Equation Modeling (SEM) was used to test the conceptual model.

Table 3 shows the results of the SEM. The results show that a customized sharing setting significantly increases consent rate (estimate =0.283; P-value <0.001).

Variable	Estimate
Customized Sharing Setting	0.283***
Privacy Concerns	-0.149**
Social Influence	0.208***
Trust in HP	0.106*
Health Concerns	0.079*
Perceived Usefulness	0.375***
CFI	0.976
TLI	0.971
RMSEA	0.044
X ² /DF	1.739
***= $P < 0.001$; **= $P < 0.01$; *= $P < 0.1$	

Table 3. SEM Results for All Models

```

PROC CALIS DATA=WUSS.gc;

  path

    INT ---> INT_1 INT_2 INT_3 = 1. ly02_1 ly03_1,
    PC ---> PC_1 PC_2 PC_3 = 1. ly05_2 ly06_2,
    THP ---> THP_1 THP_2 THP_3 = 1. ly08_3 ly09_3,
    PU ---> PU_1 PU_2 PU_3 = 1. ly11_4 ly12_4,
    SI ---> SI_1 SI_2 SI_3 = 1. ly14_5 ly15_5,
    HC ---> HC_1 HC_2 HC_3 = 1. ly17_6 ly18_6,
    PC ---> INT,
    THP ---> INT,
    PU ---> INT,
    SI ---> INT,
    HC ---> INT,
    SS ---> INT,
    nochron ---> INT,
    MALE ---> INT;

  pcov

    PC THP, PC PU, PC SI, PC HC, PC nochron, PC MALE, PC SS,
    THP PU, THP SI, THP HC, THP nochron, THP MALE, THP SS,
    PU SI, PU HC, PU nochron, PU MALE, PU SS,
    SI HC, SI nochron, SI MALE, SI SS,
    HC nochron, HC MALE, HC SS,
    MALE nochron, nochron SS,
    MALE SS;

run;

```

CONCLUSION

The results suggest that customized sharing settings will increase consent rate and engage patients in HIEs compared to non-customized sharing settings. The findings also suggest that customized sharing settings can mitigate privacy concerns for patients.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

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